

Ethics for Engineers

Rice University, RCEL Spring 2019

Course Description

"Killing is wrong!" "You ought not lie." "Do unto others as you would like them to do unto you".

These are all examples of *moral statements*. In this class, we will be asking questions about the nature of morality and ethical inquiry. But ethics for engineers is not about theory and philosophy: it is about the application of moral and ethical principles to the practice of engineering.

Engineers can encounter a variety of ethical issues and dilemmas in fulfilling their professional responsibilities. Ethical problems are somewhat analogous to engineering design problems: both involve significant complexities, high degrees of uncertainty, a number of boundary conditions and constraints, conformance with criteria, identification and evaluation of alternatives responses, and deciding on the best solution or action.

The course is based on case studies and discussions, complementing lectures and movie clips that highlight specific engineering ethical issues. The team learning structure will help student increase their awareness, understanding and practical resolution of common ethical issues that engineers can encounter. Small teams (2-4 students) focus on the application of course concepts through case discussion, problem-solving and decision-making.

A short theoretical introduction will serve to anchor the course in philosophical ethical and engineering bases. The greater part of the time in this course will be spent on the engineering ethics case studies. The final sessions will deal with team presentations of specific engineering dilemmas related to "wicked problems" with fuzzy information and ambiguous solutions, e.g., global warming, social engineering, and urban development.

Teaching methodology

This is a case-studies based course. The classes will include lectures, interviews, film clips, case discussions, analysis of current topics relevant to ethics, student presentations and report. Case discussions and exercises are a vital part of the learning experience, to quickly translate the theoretical knowledge gained from lectures into practical skills through application. There will be a substantial amount of reading for each class. Participants are expected to complete reading assignments and other preparations in addition to attending classes.

Course Level

This course is open to both graduate and undergraduate students.

Course Objectives:

The objectives of this course are to provide engineering students and practitioners with:

- An understanding of their duties and responsibilities as professionals

- Basic knowledge to make informed ethical decisions when confronted with problems in the working environment.
- Improved awareness of potential ethical issues within an engineering context.
- Team skills through working in teams on assignments and in-class assignments.
- Subjective analytical skills through investigation and evaluation of ethical problems in engineering settings.
- Improved communications skills with regard to ethical and professional issues in engineering.
- Knowledge, understanding and ability to address contemporary issues in engineering ethics.

Expected outcomes

- Students will have the improved ability to function on multidisciplinary teams.
- Students will have an understanding of professional and ethical responsibility.
- Students will have an improved ability to communicate effectively.
- Students will have the broad education necessary to better understand the impact of engineering solutions in a global/societal context
- Students will gain the ability to critically evaluate “fuzzy” problems, identify the alternative solutions, and decide on a course of action.

Class policies and expectations

The Honor Code of Rice University governs all of your work in this course. If you are uncertain about the application of the Honor Code to a particular assignment, check with me before you begin working on it. Recall that plagiarism of any kind is a violation of the Rice Honor Code. Generally, plagiarism is the consequential use of another's work without appropriate attribution. If in doubt, cite...

Grading

- Class participation (30%)
 - Attendance is mandatory
 - In-class discussions – participate, discuss, question
 - Quality, not quantity
- Assignments (70%)
 - Five cases – 10% each
 - Final presentation – 20%

Cellphones may not be used in class.

Laptops may be used in class for class-related activity.

Accommodation for Disability – If you have a documented disability that will affect your work in this class, please discuss your needs with me. Additionally, you will need to register with the Disability Support Services Offices in the Ley Student Center.

Course Calendar

LEC #	TOPICS	ASSIGNMENTS
Part 1: Theory		
1	Introduction to the Course: Purpose, Objectives, Scope, Methods, Discussion	Read: The case study methodology
2	Introduction to Ethics I Case discussion: Editing babies' DNA	Read: An enemy of the people Read: New York Times, gene edited twins
3	Introduction to Ethics II – Theories Case discussion: Ford Pinto Case Discussion: Space Challenger	Read Challenger and Pinto cases, watch videos
4	Introduction to Engineering Ethics: Codes of Ethics	Become familiar with the Texas Professional engineering code. We will discuss it in class.
Part 2: Case Studies		
5	Case Studies: Finish Challenger Case; Ford Pinto Case	Read Ford Pinto case
6	Case Studies: Chernobyl, Three Mile Island	Watch videos: Chernobyl, Three Mile Island
7	Case Studies (cont.): News Articles	Genoa Bridge, Minneapolis Bridge
8	Case Studies: What were VW engineers thinking?	Read "The Atlantic" article
9	Case Studies: B. F. Goodrich A7D Air Force Brakes	
10	First Principles of Engineering Ethics	

LEC #	TOPICS	ASSIGNMENTS
11	Solving Ethical Problems: Fuzzy logic and wicked problems	
12	Wicked problems methodology	
13	Gilbane Gold	
13	Individual, Professional, and Institutional Values	
14	Leadership in Engineering and Industry	
15	Introduction to Codes of Ethics	Overview Professional Engineer code of ethics
16	Safety	
17	Engineering students' ethics	
Part 3: Team projects		
18	Planning for special projects	
19	Planning for special projects	
20	Project presentations	
21	Project presentations	

Grading Policy

ACTIVITIES	PERCENTAGES
Class attendance and participation	25%
Homework (case reports)	50%
Project presentation	20%
Extra credit activities	10%